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10/777,691	02/13/2004	Khue Vu Nguyen		8031

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EXAMINER
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BERTAGNA, ANGELA MARIE

ART UNIT	PAPER NUMBER
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1637

MAIL DATE	DELIVERY MODE
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06/25/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

**Application No.**

10/777,691

**Applicant(s)**

NGUYEN, KHUE VU

**Examiner**

Angela Bertagna

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 30 April 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-3 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                                            |                                                                                         |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                           | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input checked="" type="checkbox"/> Other: <u>Notice to comply</u> .                 |

## **DETAILED ACTION**

### ***Status of the Application***

1. Applicant's response filed April 30, 2007 is acknowledged. Claims 1-3 are currently pending. In the response, claims 1-3 were amended.

An examination of this application reveals that applicant is unfamiliar with patent prosecution procedure. While an inventor may prosecute the application, lack of skill in this field usually acts as a liability in affording the maximum protection for the invention disclosed.

Applicant is advised to secure the services of a registered patent attorney or agent to prosecute the application, since the value of a patent is largely dependent upon skilled preparation and prosecution. The Office cannot aid in selecting an attorney or agent.

A listing of registered patent attorneys and agents is available on the USPTO Internet web site <http://www.uspto.gov> in the Site Index under "Attorney and Agent Roster." Applicants may also obtain a list of registered patent attorneys and agents located in their area by writing to the Mail Stop OED, Director of the U. S. Patent and Trademark Office, PO Box 1450, Alexandria, VA 22313-1450.

### ***Sequence Rules***

2. This application contains sequence disclosures that are encompassed by the definitions for nucleotide and/or amino acid sequences set forth in 37 CFR 1.821(a)(1) and (a)(2). However, this application fails to comply with the requirements of 37 CFR 1.821 through 1.825 for the reason(s) set forth below or on the attached Notice To Comply With Requirements For Patent Applications Containing Nucleotide Sequence And/Or Amino Acid Sequence Disclosures.

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Specifically, the claims recite SEQ ID NO's 4-7, but these sequences do not appear in either the paper or computer readable version of the Sequence Listing as required by the Sequence Rules. In order to comply with the Sequence Rules, Applicant must submit a new substitute Sequence Listing in paper and computer readable form that includes SEQ ID NO: 1-7. This new substitute Sequence Listing must be accompanied by a statement that the substitute Sequence Listing includes no new matter and that the paper and computer readable versions are the same. See MPEP 2426 for further information regarding amendments to the Sequence Listing. Failure to comply with these requirements will result in ABANDONMENT of the application under 37 CFR 1.821(g).

***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-3 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1-3 are indefinite, because they recite SEQ ID numbers that are not present in the Sequence Listing, as discussed above. This causes the claims to be indefinite, because it is unclear what nucleic acid sequence is being claimed. Based on the prosecution history and in the interest of compact prosecution, the following interpretation of the newly added SEQ ID numbers has been used: (a) SEQ ID NO: 4 been considered to mean the sequence of the PCR II plasmid vector, (b) SEQ ID NO: 5 has been considered to mean the sequence of the pFastBac

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Htb baculovirus transfer vector, (c) SEQ ID NO: 6 has been considered to mean the sequence of the pBlueBacHis2A baculovirus transfer vector, and (d) SEQ ID NO: 7 has been considered to mean the sequence of the pET-28a(+) vector.

Claims 1-3 are also indefinite, because they recite the trademark/trade names INV  $\alpha$ F', pFastBac HTb, DH10Bac, pBlueBacHis2A, Bac-N-Bac, pCR II, and pET-28a(+). Where a trademark or trade name is used in a claim as a limitation to identify or describe a particular material or product, the claim does not comply with the requirements of 35 U.S.C. 112, second paragraph. See *Ex parte Simpson*, 218 USPQ 1020 (Bd. App. 1982). The claim scope is uncertain since the trademark or trade name cannot be used properly to identify any particular material or product. A trademark or trade name is used to identify a source of goods, and not the goods themselves. Thus, a trademark or trade name does not identify or describe the goods associated with the trademark or trade name. In the present case, the trademark/trade names are used to identify/describe vectors and competent cells, and accordingly, the identification/description is indefinite. This rejection could be overcome by substituting a generic descriptor of the trademarked vectors and competent cells. It is also noted that substitution of a generic descriptor of the vectors in place of the SEQ ID numbers (SEQ ID NO: 4-7) would obviate the need to submit a substitute Sequence Listing.

#### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirth et al.

(American Journal of Human Genetics (1999) 64: 1340-1356) in view of Lefebvre et al. (Cell (1995) 80: 155-165) and further in view of Powell (PCR Protocols: A Guide to Methods and Applications (1990) by Academic Press, Inc. pages 237-243) and further in view of Buck (Biotechniques (1999) 27(3): 528-36) and further in view of Innis et al. (PCR Protocols: A Guide to Methods and Applications (1990) by Academic Press, Inc. pages 3-12) and further in view of the 1997 Invitrogen catalog (published 1997, page 85).

Wirth teaches a method comprising RT-PCR of the human SMN1 gene and cloning of the resulting products (see pages 1342-1343).

Specifically, the method of Wirth comprises:

(a) isolating RNA (page 1342 "RNA isolation and RT-PCR section")

(b) performing an RT reaction using oligo-dT primers under the conditions specified by Life Technologies for use with the M-MLV reverse transcriptase (65°C denaturation for 5 minutes, quick chill on ice, room temperature (approximately 25°C) for 10 minutes, and reverse transcription at 37°C for 50 minutes – see page 1342 "RNA isolation and RT-PCR" section and also the attached product information sheet from Life Technologies)

(c) performing PCR using two specific oligonucleotide primers where the reaction conditions comprise: 94°C for 2 min followed by 30 cycles of 15 sec at 94°C, 30 sec at 67°C,

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and 1 min at 72°C, with the elongation time being extended by 20 seconds in each cycle beginning at cycle 11 (page 1342 “RNA isolation and RT-PCR” section)

(d) ligating the PCR product of the SMN gene into the pCRII-TOPO plasmid vector and introducing the ligation products into competent cells (page 1343, column 1)

(e) screening for inserts based on the presence of white colonies that result from selection of the vector-SMN product (page 1343, column 1).

Wirth teaches reverse transcription using oligo-dT primers rather than the instantly claimed SEQ ID No: 1 using slightly different reaction conditions than those instantly claimed. Specifically, Wirth teaches: (a) denaturation at 65°C for 5 minutes rather than denaturation at 90°C for 5 minutes, (b) a quick chill on ice without a specific incubation time, and (c) reverse transcription at 37°C for 50 minutes rather than at 42°C for 45 minutes.

Also, the PCR of Wirth utilizes different primers than the instantly claimed SEQ ID Nos: 2 and 3 and slightly different reaction conditions. Specifically, Wirth teaches: (a) denaturation at 94°C for 2 minutes initially followed by 15 seconds in subsequent cycles rather than 1 minute denaturations in all cycles, (b) annealing at 67°C for 30 seconds rather than at 55°C for 2 minutes, and (c) elongating for an additional 20 seconds in each cycle following cycle 11. Also, Wirth performs 30 cycles of PCR amplification rather than the 35 cycles of claim 1.

Finally, Wirth does not teach transformation into INVa F' competent E. coli cells.

Lefebvre teaches the nucleic acid sequence of the human SMN1 gene (Figure 3, page 158).

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Powell teaches that reverse transcription may be performed using oligo-dT primers or a specific primer (page 243). Powell further states, "One of the advantages of using specific primers close to the site of modification is that cDNA synthesis and subsequent amplification may be performed on less than intact preparations of total RNA" (page 243).

Buck analyzed the effect of primer design strategy on the performance of DNA sequencing primers. Specifically, Buck invited primer submissions from a number of labs (39) (page 532, column 3), with 69 different primers being submitted (see page 530, column 1). Buck also tested 95 primers spaced at 3 nucleotide intervals along the entire sequence at issue, thereby testing more than 1/3 of all possible 18 mer primers on the 300 base pair sequence (see page 530, column 1). When Buck tested each of the primers selected by the methods of the different labs, Buck found that every single primer worked (see page 533, column 1). Only one primer ever failed, No. 8, and that primer functioned when repeated. Further, every single control primer functioned as well (see page 533, column 1). Buck expressly states "The results of the empirical sequencing analysis were surprising in that nearly all of the primers yielded data of extremely high quality (page 535, column 2)." Therefore, Buck provides direct evidence that all primers would be expected to function, and in particular, all primers selected according to the ordinary criteria, however different, used by 39 different laboratories. It is particularly striking that all 95 control primers functioned, which represent 1/3 of all possible primers in the target region. This clearly shows that every primer would have a reasonable expectation of success.

Innis teaches general conditions for PCR amplification. These conditions are: 25 – 35 cycles of 96°C for 15 seconds (usually with a longer initial denaturation step), 55°C for 30



seconds, and 72°C for 1.5 minutes (page 4). Innis expressly states, "It can be highly advantageous to optimize the PCR for a given application" (page 4). Innis further teaches on pages 7-9, that parameters such as the time and/or temperature of the denaturation, annealing, and extension steps, as well as the number of cycles should be optimized based on the specific properties (base composition, length, concentration) of the target and primer sequences.

The 1997 Invitrogen catalog (page 85) teaches INVαF' competent E. coli cells. This strain is recA and endonuclease A deficient. Invitrogen teaches that these cells "are ideal for propagating plasmids and cDNA library construction. They allow stable replication of high-copy plasmids" (page 85). The genotype offers the following features: (a) blue-white screening, (b) reduction of homologous recombination of transformed plasmids (recA), and (c) increased quality of plasmid DNA preparations (endA1) (see page 85).

It would have been prima facie obvious for one of ordinary skill in the art at the time of invention to combine the teachings of Wirth, Lefebvre, Powell, Buck, Innis, and the 1997 Invitrogen catalog. Wirth expressly taught cloning of RT-PCR products generated from the human SMN gene. Since Powell taught that a specific reverse transcription primer permitted cDNA synthesis and subsequent amplification from less than intact RNA preparations (see above), an ordinary practitioner would have been motivated to substitute a specific RT primer for the oligo-dT primer of Wirth in order to promote more robust, accurate cDNA synthesis. Furthermore, since the SMN gene sequence was known, as evidenced by Lefebvre (cited above), and since Buck demonstrated the equivalence of different primer sequences (see above), the

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person of ordinary skill would have been motivated to select any desired specific reverse transcription and PCR amplification primers based on the known SMN gene sequence to clone the gene expecting a reasonable level of success.

Regarding the selection of particular primer sequences, attention is also directed to the court decision *In Re Deuel* 34 USPQ 2d 1210 (Fed. Cir. 1995) where the Court of Appeals for the Federal Circuit determined that the existence of a general method of identifying a specific DNA does not make the specific DNA obvious. Regarding structural or functional homologues, however, the Court stated,

"Normally, a *prima facie* case of obviousness is based upon structural similarity, i.e., an established structural relationship between a prior art compound and the claimed compound. Structural relationships may provide the requisite motivation or suggestion to modify known compounds to obtain new compounds. For example, a prior art compound may suggest its homologs because homologs often have similar properties and therefore chemists of ordinary skill would ordinarily contemplate making them to try to obtain compounds with improved properties".

As noted above, the human SMN sequence was well known in the art at the time of invention, as evidenced by Figure 3 of Lefebvre. Since the claimed primers simply represent structural homologues, which were derived from a sequence suggested by the prior art as useful for amplification primers, and concerning which a biochemist of ordinary skill would obtain alternate compounds with similar properties, the claimed primers are *prima facie* obvious over the cited references in the absence of secondary considerations.

Furthermore, since Innis taught that PCR amplification conditions should be optimized based on the base composition, length, and concentration of the target and primer sequences (see page 4 and 7-9, cited above), an ordinary practitioner would have motivated to optimize the

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thermal cycling profile in order to maximize product yield without compromising reaction

specificity. Attention is further directed to the court decision *In re Aller*, 105 USPQ 233 at 235:

More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.

Routine optimization is not considered inventive and no evidence has been presented that the selection of the claimed RT and PCR reaction conditions was other than routine or that the results should be considered unexpected in any way as compared to the closest prior art.

Finally, since the Invitrogen catalog taught that INV $\alpha$ F' cells were useful for routine cloning applications (see above), an ordinary practitioner would have been motivated to substitute any suitable known competent cell line in the method. As noted in MPEP 2144.06, substitution of equivalents useful for the same purpose is prima facie obvious.

Therefore, the person of ordinary skill in the art, interested in cloning the human SMN gene, would have been motivated to perform the RT-PCR method taught by Wirth using any primer set derived from the known human SMN gene sequence, as suggested by Powell, Lefebvre, and Buck, under optimized reaction conditions, as suggested by Innis, followed by transformation into any known competent cell line, such as the INV $\alpha$ F' cells taught in the Invitrogen catalog, thus resulting in the instantly claimed method.

6. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al. (US 2003/0049627) in view of Lefevre et al. (Cell (1995) 80: 155-165) and further in view of Buck et

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al. (Biotechniques (1999) 27(3): 528-36) and further in view of Innis et al. (PCR Protocols: A Guide to Methods and Applications (1990) by Academic Press, Inc. pages.3-12) and further in view of the Invitrogen TOPO TA cloning manual, version N (copyright 1999-2001) and further in view of the 1997 Invitrogen catalog (published 1997, page 85).

Nguyen teaches an RT-PCR method of cloning the human SMN gene (paragraphs 30-38).

Briefly, the method of Nguyen comprises:

(a) isolating RNA (paragraphs 29-30)

(b) performing an RT reaction using a specific oligonucleotide sequence based on the known SMN gene – CACATTGCATTTG (paragraph 32) under the following reaction conditions: 90°C for 2 minutes, cooling on ice 1 minute, 25°C for 10 minutes, 42°C for 45 minutes (paragraph 33)

(c) performing PCR using two synthesized oligonucleotides (SEQ ID Nos: 3-4 of Nguyen) under the following conditions: denaturation at 94°C for 1 minute; annealing at 55°C for 2 minutes, elongation at 72°C for 1 minute for 25 cycles (paragraph 35). Nguyen also taught PCR amplification of the SMN gene using the sequence: TCCTTAATTTAAGGAATGTGA (sequence g in paragraph 38). This sequence (sequence g of the Nguyen publication) overlaps with the instant SEQ ID No: 3 in 17/21 nucleotides. The differences between sequence g of Nguyen and the instant SEQ ID No: 3 are: (a) the presence of an additional three nucleotides at the 5' end in sequence g of Nguyen and (b) the absence of the four 3' terminal nucleotides of the instant SEQ ID No: 3 (GCAC) in sequence g of Nguyen

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(d) ligating the PCR product into a plasmid vector and introducing the ligation product into competent *E. coli* cells (paragraph 38)

(e) screening for inserts based on the presence of white colonies that results in the selection of the vector-cDNA construct (paragraph 38).

To summarize, Nguyen teaches designing the RT and PCR primers from the known human SMN gene sequence (paragraphs 30-38), and also teaches a primer highly similar to the instant SEQ ID No: 3 (see above). However, Nguyen does not teach RT-PCR using the instant SEQ ID No: 1 for the RT reaction and SEQ ID Nos: 2 & 3 for the PCR. Also, although the reaction conditions of the Nguyen PCR are highly similar to the instant claim, Nguyen teaches 25 cycles rather than the instantly claimed 35 cycles. Finally, Nguyen ligated blunt ended PCR products into the Bluescript KS(+) plasmid vector and transformed *E. coli* SURE cells instead of using the pCRII vector and transforming INVa F' cells.

Lefebvre teaches the nucleic acid sequence of the human SMN1 gene (Figure 3, page 158).

Buck analyzed the effect of primer design strategy on the performance of DNA sequencing primers. Specifically, Buck invited primer submissions from a number of labs (39) (page 532, column 3), with 69 different primers being submitted (see page 530, column 1). Buck also tested 95 primers spaced at 3 nucleotide intervals along the entire sequence at issue, thereby testing more than 1/3 of all possible 18 mer primers on the 300 base pair sequence (see page 530, column 1). When Buck tested each of the primers selected by the methods of the different labs, Buck found that every single primer worked (see page 533, column 1). Only one primer ever failed, No. 8, and that primer functioned when repeated. Further, every single control primer

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functioned as well (see page 533, column 1). Buck expressly states “The results of the empirical sequencing analysis were surprising in that nearly all of the primers yielded data of extremely high quality (page 535, column 2).” Therefore, Buck provides direct evidence that all primers would be expected to function, and in particular, all primers selected according to the ordinary criteria, however different, used by 39 different laboratories. It is particularly striking that all 95 control primers functioned, which represent 1/3 of all possible primers in the target region. This clearly shows that every primer would have a reasonable expectation of success.

Innis teaches general conditions for PCR amplification. These conditions are: 25 – 35 cycles of 96°C for 15 seconds (usually with a longer initial denaturation step), 55°C for 30 seconds, and 72°C for 1.5 minutes (page 4). Innis expressly states, “It can be highly advantageous to optimize the PCR for a given application” (page 4). Innis further teaches on pages 7-9, that parameters such as the time and/or temperature of the denaturation, annealing, and extension steps, as well as the number of cycles should be optimized based on the specific properties (base composition, length, concentration) of the target and primer sequences. Regarding the number of cycles, Innis states, “The optimum number of cycles will depend mainly upon the starting concentration of target DNA when other parameters are optimized” (page 8). Innis further provides a table of with guidance as to how many cycles should be used based on the initial concentration of the target sequence (see page 9).

The Invitrogen TOPO TA cloning manual (published 2001) teaches that the pCR®II-TOPO vector provides “a highly efficient, 5 minute, one-step cloning strategy for the direct insertion of Taq polymerase PCR amplified products into a plasmid vector. No ligase, post-PCR procedures, or PCR primers containing specific sequences are required” (page 1).

The 1997 Invitrogen catalog (page 85) teaches INV $\alpha$ F' competent E. coli cells. This strain is recA and endonuclease A deficient. Invitrogen teaches that these cells "are ideal for propagating plasmids and cDNA library construction. They allow stable replication of high-copy plasmids" (page 85). The genotype offers the following features: (a) blue-white screening, (b) reduction of homologous recombination of transformed plasmids (recA), and (c) increased quality of plasmid DNA preparations (endA1) (see page 85).

It would have been *prima facie* obvious for one of ordinary skill in the art at the time of invention to perform the RT-PCR amplification of the human SMN gene taught by Nguyen using any desired primer set under optimized reaction conditions. Nguyen expressly taught cloning of RT-PCR products generated from the human SMN gene using a specific primers in both the RT and PCR steps designed based on the known SMN gene sequence (see above, in particular, paragraphs 32, 33, and 35). Since the SMN gene sequence was known, as evidenced by Lefebvre (cited above), and since Buck demonstrated the equivalence of different primer sequences (also see above citation), the person of ordinary skill would have been motivated to select any desired specific reverse transcription and PCR amplification primers based on the known SMN gene sequence to clone the gene expecting a reasonable level of success.

Regarding the selection of particular primer sequences, attention is also directed to the court decision *In Re Deuel* 34 USPQ 2d 1210 (Fed. Cir. 1995) where the Court of Appeals for the Federal Circuit determined that the existence of a general method of identifying a specific DNA does not make the specific DNA obvious. Regarding structural or functional homologues, however, the Court stated,

"Normally, a *prima facie* case of obviousness is based upon structural similarity, i.e., an established structural relationship between a prior art compound and the claimed compound.

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Structural relationships may provide the requisite motivation or suggestion to modify known compounds to obtain new compounds. For example, a prior art compound may suggest its homologs because homologs often have similar properties and therefore chemists of ordinary skill would ordinarily contemplate making them to try to obtain compounds with improved properties”.

As noted above, the human SMN sequence was well known in the art at the time of invention, as demonstrated by Figure 3 of Lefebvre. Since the claimed primers simply represent structural homologues, which were derived from a sequence suggested by the prior art as useful for amplification primers (recall that sequence g of Nguyen is highly similar to the instant SEQ ID No: 3, discussed above), and concerning which a biochemist of ordinary skill would obtain alternate compounds with similar properties, the claimed primers are *prima facie* obvious over the cited references in the absence of secondary considerations.

Regarding the difference in reaction conditions, since Innis taught that the number of PCR cycles should be optimized based on the concentration of the target sequence (see pages 8-9, cited above), the ordinary practitioner would have motivated to optimize the number of cycles in order to maximize product yield without compromising reaction specificity. Attention is further directed to the court decision *In re Aller*, 105 USPQ 233 at 235:

More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.

Routine optimization is not considered inventive and no evidence has been presented that the selection of the claimed PCR reaction conditions (35 cycles versus 25 cycles in the prior art) was other than routine or that the results should be considered unexpected in any way as compared to the closest prior art.



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Finally, regarding the ligation and screening steps, an ordinary practitioner would have been motivated to ligate the SMN PCR products into the pCRII-TOPO vector, since the Invitrogen TOPO TA cloning manual taught that use of this vector offered “a highly efficient, 5 minute, one-step cloning strategy for the direct insertion of Taq polymerase PCR amplified products into a plasmid vector. No ligase, post-PCR procedures, or PCR primers containing specific sequences are required (page 1).” Thus, an ordinary practitioner would have been motivated to substitute the pCRII-TOPO vector for the Bluescript KS(+) vector taught by Nguyen in order to save time, money, and reagents during the ligation step. Also, since the Invitrogen catalog taught that INV $\alpha$ F' cells were useful for routine cloning applications (see above), an ordinary practitioner would have been motivated to substitute any suitable known competent cell line in the method (e.g. the SURE competent cells taught by Nguyen for the INV $\alpha$ F' cells taught by the Invitrogen catalog). As noted in MPEP 2144.06, substitution of equivalents useful for the same purpose is *prima facie* obvious.

Thus, one of ordinary skill in the art, interested in cloning the human SMN gene, would have been motivated to perform the human SMN RT-PCR method taught by Nguyen using any primer set derived from the known human SMN gene sequence, as suggested by Lefebvre and Buck, under optimized reaction conditions, as suggested by Innis, followed by ligation into the pCRII-TOPO vector as suggested by the Invitrogen TOPO TA manual and transformation into INV $\alpha$ F' cells as suggested by the Invitrogen catalog, thus resulting in the instantly claimed method.

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7. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Melki et al. (USPN 6,080,577) in view of the Invitrogen TOPO TA cloning manual, version N (copyright 1999-2001) and further in view of the Invitrogen Bac-to-Bac Baculovirus Expression System product information sheet (published 2002 by Invitrogen) and further in view of the Invitrogen pBlueBacHis2 A, B, and C product information sheet, version G (published Feb. 7, 2003), and further in view of the 1997 Invitrogen catalog (published 1997, page 85) and further in view of Sambrook et al. (Molecular cloning: a laboratory manual (1989) by Cold Spring Harbor, N.Y.: Cold Spring Harbor Laboratory, pages 1.53-1.61).

Melki teaches construction of SMN expression plasmids (see column 3, lines 56-60).

Melki teaches that the SMN gene may be expressed in “plasmids, cosmids, phages, YAC, pYAC, and the like” (column 13, lines 39-42). Melki further teaches expression in baculovirus cells (column 13, lines 49-50).

Melki teaches general methods for transferring the SMN gene between vectors comprising restriction digestion and ligation into a bacteriophage vector, and sequencing with M13 primers (see, for example, Example 6, column 28, lines 30-59).

However, Melki does not transfer the SMN gene from the pCR®II vector to the pFastBac vector followed by transformation into INVαF' and DH10Bac cells, colony screening and sequencing.

The Invitrogen Bac-to-Bac Baculovirus Expression System product information teaches that this expression system offers: “(a) tremendous time savings over traditional baculovirus methods, (b) high-level recombinant protein yields, (c) easy cloning (see page 1).” This product information sheet teaches that the pFastBac™ vector offers “high-level, native protein

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expression and a large multiple cloning site for simplified cloning” (page 3). This product information sheet further teaches that the multiple cloning site has BamHI and XhoI sites (see Figure 4). Finally, the product information sheet teaches transformation of the recombinant pFastBac™ construct into DH10Bac competent E. coli followed by blue-white screening for inserts (see page 5 and Figure 6).

This product information sheet does not teach screening in INV $\alpha$ F' cells or generating an expression construct using the pBlueBacHis2 A™ vector. Also, this product information sheet ~~does not teach that the~~ construct is generated by digesting the gene of interest from the pCR®II vector.

The Invitrogen pBlueBacHis2 A, B, and C product information sheet teaches that these baculovirus transfer vectors are designed for expression and purification of recombinant proteins in insect cells (page 1). This product information sheet states, “The histidine residues create a high-affinity metal binding site to allow purification of recombinant fusion proteins on nickel-chelating resin” (page 1). This reference teaches that the vector has BamHI and XhoI sites in the multiple cloning site (see page 3), and further teaches that the vector has blue-white screening capabilities (see Appendix, page 11).

Similar to the previous reference, this product information sheet does not provide specific details of the method of transferring a gene in a pFastBac™ vector to the pBlueBacHis2 A vector, such as alkaline phosphatase treatment or use of a specific cloning vector (pCR®II). Rather, the user is directed to Sambrook et al. (Molecular cloning: a laboratory manual, 1989) or other similar references for guidance (see page 2). Also, although this reference recommends

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transformation into a *recA* and endonuclease A deficient strain and provides several examples of suitable bacterial strains, INV $\alpha$ F' cells are not explicitly taught (page 2).

The 1997 Invitrogen catalog (page 85) teaches INV $\alpha$ F' competent *E. coli* cells. This strain is *recA* and endonuclease A deficient. Invitrogen teaches that these cells "are ideal for propagating plasmids and cDNA library construction. They allow stable replication of high-copy plasmids" (page 85). The genotype offers the following features: (a) blue-white screening, (b) reduction of homologous recombination of transformed plasmids (*recA*), and (c) increased quality of plasmid DNA ~~preparations~~ (endA1) (see page 85).

The Invitrogen TOPO TA cloning manual (published 2001) teaches that the pCR $\text{\textcircled{R}}$ II-TOPO vector provides "a highly efficient, 5 minute, one-step cloning strategy for the direct insertion of Taq polymerase PCR amplified products into a plasmid vector. No ligase, post-PCR procedures, or PCR primers containing specific sequences are required" (page 1). This vector contains BamHI and XhoI sites in the cloning site (see page 10).

Sambrook teaches a general protocol for cloning in plasmid vectors. Sambrook teaches that genes may be transferred between different vectors (such as a cloning and expression vector) via restriction enzyme digestion to release the fragment of interest followed by ligation into the new vector and transformation into competent *E. coli* (page 1.53-1.54; see also Figure 1.6). Sambrook teaches that digestion with two different restriction enzymes is desirable, because the background of nonrecombinant clones is low and the insert is only capable of ligation in one orientation (see Table 1.2). Sambrook teaches that the vector must also be digested using the same restriction enzymes used to release the insert, followed by alkaline phosphatase treatment

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to prevent re-circularization of the vector (see Figure 1.8 and pages 1.60-1.61, where calf intestinal alkaline phosphatase is taught).

It would have been prima facie obvious for one of ordinary skill in the art at the time of invention to construct expression plasmids of the human SMN gene in either the FastBac or BlueBacHis2A expression vectors according to the claimed procedure. Melki taught expression constructs of the human SMN gene using a variety of different vectors, including baculovirus vectors (see above), but did not specify a preferred baculovirus expression vector system. As discussed above, the FastBac and BlueBacHis2A systems offered the user rapid, stable expression of recombinant proteins. The BlueBacHis2A system further afforded the ability to rapidly and efficiently purify the expressed protein using a histidine affinity tag (see above product information sheet). The ordinary practitioner would have been motivated to generate SMN expression constructs as suggested by Melki using the baculovirus vectors taught by Invitrogen in order to rapidly produce a high yield of recombinant protein, capable of being purified using simple, often one-step affinity-based methods. Since the Invitrogen product information sheets provided specific guidance as to the method of producing the expression construct, and Sambrook taught specific details of molecular cloning, the ordinary practitioner would have expected a reasonable level of success in producing the claimed expression constructs. Finally, regarding the choice of cloning host cells, the Invitrogen product information sheet for pBlueBacHis2A taught that the major requirement for the host cell is a strain deficient in recA and endA activity, and further taught that in addition to the exemplary E. coli strains mentioned on page 2, other equivalent strains could be used. Since the Invitrogen catalog taught that INV $\alpha$ F' cells were recA and endA deficient and useful for routine cloning

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applications (see above), the ordinary practitioner would have been motivated to substitute any suitable *recA* *endA* deficient cell line in the method. In short, the claimed method is directed to obtaining an expression construct of a known gene (SMN) in a known expression system (FastBac or BlueBacHis2A) using well-known, standard methods, and therefore is *prima facie* obvious in light of the prior art teachings cited above.

8. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Melki et al. (USPN 6,080,577) in view of the Novagen pET system manual (published February 1999) and further in view of Novagen catalog No. TB074 (December, 1998) and further in view of the 1997 Invitrogen catalog (published 1997, page 85).

Melki teaches general methods for transferring the SMN gene between vectors comprising restriction digestion and ligation into a bacteriophage vector, and sequencing with M13 primers (see, for example, Example 6, column 28, lines 30-59).

Melki teaches many different expression systems including baculovirus and bacterial expression vectors (column 13, lines 39-42), but does not specify the pET-28a(+) bacterial expression vector. Also, Melki does not teach transfer the SMN gene from the pFastBac vector followed by transformation into INV $\alpha$ F' cells and colony screening.

The pET system is a bacterial expression system developed by Novagen. The pET system manual states, "The pET system is the most powerful system yet developed for the cloning and expression of recombinant proteins in *E. coli*. Target genes are cloned in pET plasmids under control of strong bacteriophage T7 transcription and (optionally) translation signals; expression is induced by providing a source of T7 RNA polymerase in the host cell. T7

RNA polymerase is so selective and active that almost all of the cell's resources are converted to target gene expression; the desired product can comprise more than 50% of the total cell protein a few hours after induction. Another important benefit of this system is its ability to maintain target genes transcriptionally silent in the uninduced state. Target genes are initially cloned using hosts that do not contain the T7 RNA polymerase gene, thus eliminating plasmid instability due to the production of proteins potentially toxic to the host cell....Two types of T7 promoter and several hosts that differ in their stringency of suppressing basal expression levels are available, providing great flexibility and the ability to optimize the expression of a wide variety of target genes" (page 3). The manual further teaches that the pET-28a(+) vector contains an N-terminal histidine tag for simple affinity purification of the recombinant protein (see Table on page 6).

Regarding preparation of a pET expression construct the manual presents the following procedure (see page 15 for a flowchart and specific recommendations on pages 18-26):

(a) prepare the pET vector by restriction enzyme digestion and dephosphorylation (step 1 on page 15; see also pages 18-19, where more details of the restriction enzyme digestion are presented and calf intestinal alkaline phosphatase is used to dephosphorylate the vector)

(b) prepare the insert DNA by restriction digestion (step 2 on page 15; see also page 19 for specific details of the digestion and isolation of the digested fragment)

(c) ligation of the insert and vector followed by transformation into the appropriate host (step 3 on page 15; see also pages 20-22 for specific details of the ligation and transformation)

(d) identify positive clones by colony PCR, miniprep, sequencing or in vitro transcription/translation (step 4 on page 15; see also pages 22-26 for specific details)

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The manual teaches that suitable hosts for cloning include the following *recA* and *endA* deficient strains: NovaBlue, JM109, and DH5a (page 8), but does not teach the INV $\alpha$ F' strain. Also the pET system manual does not teach digestion using the BamHI and XhoI restriction enzymes.

Novagen catalog No. TB074 teaches the vector map of the pET-28a(+) vector. This vector contains BamHI and XhoI sites in the cloning region (see page 1).

The 1997 Invitrogen catalog (page 85) teaches INV $\alpha$ F' competent *E. coli* cells. This strain is *recA* and *endonuclease A* deficient. Invitrogen teaches that these cells "are ideal for propagating plasmids and cDNA library construction. They allow stable replication of high-copy plasmids" (page 85). The genotype offers the following features: (a) blue-white screening, (b) reduction of homologous recombination of transformed plasmids (*recA*), and (c) increased quality of plasmid DNA preparations (*endA1*) (see page 85).

It would have been *prima facie* obvious for one of ordinary skill in the art at the time of invention to construct expression plasmids of the human SMN gene in the pET-28a(+) expression system. Melki taught expression constructs of the human SMN gene using a variety of different vectors, including bacterial plasmid vectors (column 13, lines 39-42, cited above), but did not specify a preferred bacterial expression vector system. As discussed above, the pET system offered rapid, stable, high-yield expression of recombinant proteins modified with a histidine tag for simple affinity purification (see above citation). The ordinary practitioner would have been motivated to generate SMN expression constructs as suggested by Melki using the pET-28a(+) vector taught by Novagen in order to rapidly produce a large amount of recombinant protein, suitable for simple, often one-step affinity-based purification. Since the Novagen



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product information sheets provided specific guidance as to the method of producing the expression construct (see above), and the vector map taught that the BamHI and XhoI sites were available in the cloning site, the ordinary practitioner would have expected a reasonable level of success in producing the claimed expression constructs. Regarding the choice of cloning host cells, the Novagen pET system manual expressly taught that the major requirement for the host cell is a strain deficient in recA and endA activity, and further taught that in addition to the exemplary E. coli strains mentioned on page 8, other equivalent strains could be used. Since the Invitrogen catalog taught that INV $\alpha$ F' cells were recA and endA deficient and useful for routine cloning applications (see above), the ordinary practitioner would have been motivated to substitute any suitable recA endA deficient cell line in the method. In short, the claimed method is directed to obtaining an expression construct of a known gene (SMN) in a known expression system (pET) using well-known, standard methods, and therefore is prima facie obvious in light of the prior art teachings cited above.

### ***Response to Arguments***

9. Applicant's amendment to the abstract is noted, and the previous objection to the specification is withdrawn.

Applicant's remarks do not appear to address the rejection of claims 1-3 under 35 U.S.C. 112, 2<sup>nd</sup> paragraph. Applicant's amendment to claim 1 was sufficient to overcome the rejection of claim 1 as lacking essential method steps. However, the amendments to claims 1-3 were not sufficient to overcome the rejection of claims 1-3 under 35 U.S.C. 112, 2<sup>nd</sup> paragraph for reciting trademarks/trade names in the claims. These claims continue to recite trademarked products

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(e.g. pFastBac HTb, pBlueBacHis2A), and therefore, the rejections have been maintained. As discussed above, substitution of the trademarked names with a generic descriptor would overcome the rejection.

Applicants arguments regarding the rejection of claims 1-3 under 35 U.S.C. 103(a) have been fully considered but were not found persuasive. Regarding claim 1, Applicant argues that the selection of the claimed primers is not obvious, since they specifically amplify only SMN (pages 1-2). This argument was not found persuasive, because motivation to use a specific primer for reverse transcription is found in the teachings of Powell cited above. Also, as discussed above, since the complete SMN gene sequence was known in the art, an ordinary practitioner would have been motivated to design any primer pair for specific amplification of the SMN gene, and therefore, the primer design step is a matter of routine optimization rather than inventive effort. Furthermore, there is no evidence in the record to suggest that the claimed primers perform better than other SMN-specific primers taught in the art. As noted in MPEP 716.02, evidence of unexpected results should compare the claimed invention with the closest prior art. Finally, regarding the PCR reaction parameters, as discussed above, absent evidence that the claimed conditions were unexpectedly better, the differences in the number of amplification cycles or the reaction temperatures are a matter of routine optimization rather than inventive effort, and therefore, are obvious.

Regarding claims 2 and 3, Applicant argues that the claimed methods are not obvious, and Applicant's contribution over the art is the selection of the most powerful expression vectors for production of recombinant SMN proteins (pages 3-7). Applicant's arguments were not found persuasive, because as discussed above, an ordinary practitioner would have been motivated to

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insert the SMN gene into the claimed vectors, since the cited references taught that these vectors were particularly useful for obtaining a high yield of recombinant proteins conveniently tagged with an affinity tag for simple protein purification. An ordinary practitioner would have had a reasonable expectation of success in doing so, since the cited product manuals expressly teach procedures for generating expression constructs using the disclosed systems. As discussed above, in the absence of unexpected results indicating that the claimed methods performed unexpectedly better or other secondary considerations, the claimed methods are prima facie obvious in view of the cited references.

In short, the claimed methods are directed to methods for cloning a known gene and constructing expression plasmids using commercially available products and standard molecular biology methods. The cited references provide explicit motivation for conducting the claimed methods, because they teach that the use of the disclosed expression systems, cell lines, and kits in routine cloning and expression procedures simplifies the cloning process, saves time and resources, improves the expression yield, and simplifies recombinant protein purification. In the absence of evidence indicating that the claimed methods perform unexpectedly better than what would be expected given the teachings in the prior art, the claimed methods must be considered to be prima facie obvious in view of the cited references. Accordingly, the rejections of claims 1-3 under 35 U.S.C. 103(a) are maintained.

***Conclusion***

10. No claims are currently allowable.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

This action is a **final rejection** and is intended to close the prosecution of this application. Applicant's reply under 37 CFR 1.113 to this action is limited either to an appeal to the Board of Patent Appeals and Interferences or to an amendment complying with the requirements set forth below.

If applicant should desire to appeal any rejection made by the examiner, a Notice of Appeal must be filed within the period for reply identifying the rejected claim or claims appealed. The Notice of Appeal must be accompanied by the required appeal fee of \$250.

If applicant should desire to file an amendment, entry of a proposed amendment after final rejection cannot be made as a matter of right unless it merely cancels claims or complies

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with a formal requirement made earlier. Amendments touching the merits of the application which otherwise might not be proper may be admitted upon a showing a good and sufficient reasons why they are necessary and why they were not presented earlier.

A reply under 37 CFR 1.113 to a final rejection must include the appeal from, or cancellation of, each rejected claim. The filing of an amendment after final rejection, whether or not it is entered, does not stop the running of the statutory period for reply to the final rejection unless the examiner holds the claims to be in condition for allowance. Accordingly, if a Notice of Appeal has not been filed properly within the period for reply, or any extension of this period obtained under either 37 CFR 1.136(a) or (b), the application will become abandoned.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Angela Bertagna whose telephone number is 571-272-8291. The examiner can normally be reached on M-F, 7:30 - 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gary Benzion can be reached on 571-272-0782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Angela Bertagna  
Art Unit 1637

amb

  
KENNETH R. HORLICK, PH.D.  
PRIMARY EXAMINER  
6/20/07

<b>Notice to Comply</b>	Application No. 10/777,691	Applicant(s) Khue Vu Nguyen	
	Examiner Angela Bertagna	Art Unit 1637	

**NOTICE TO COMPLY WITH REQUIREMENTS FOR PATENT APPLICATIONS CONTAINING NUCLEOTIDE SEQUENCE AND/OR AMINO ACID SEQUENCE DISCLOSURES**

Applicant must file the items indicated below within the time period set the Office action to which the Notice is attached to avoid abandonment under 35 U.S.C. § 133 (extensions of time may be obtained under the provisions of 37 CFR 1.136(a)).

The nucleotide and/or amino acid sequence disclosure contained in this application does not comply with the requirements for such a disclosure as set forth in 37 C.F.R. 1.821 - 1.825 for the following reason(s):

- ☒ 1. This application clearly fails to comply with the requirements of 37 C.F.R. 1.821-1.825. Applicant's attention is directed to the final rulemaking notice published at 55 FR 18230 (May 1, 1990), and 1114 OG 29 (May 15, 1990). If the effective filing date is on or after July 1, 1998, see the final rulemaking notice published at 63 FR 29620 (June 1, 1998) and 1211 OG 82 (June 23, 1998).
- ☐ 2. This application does not contain, as a separate part of the disclosure on paper copy, a "Sequence Listing" as required by 37 C.F.R. 1.821(c).
- ☐ 3. A copy of the "Sequence Listing" in computer readable form has not been submitted as required by 37 C.F.R. 1.821(e).
- ☐ 4. A copy of the "Sequence Listing" in computer readable form has been submitted. However, the content of the computer readable form does not comply with the requirements of 37 C.F.R. 1.822 and/or 1.823, as indicated on the attached copy of the marked -up "Raw Sequence Listing."
- ☐ 5. The computer readable form that has been filed with this application has been found to be damaged and/or unreadable as indicated on the attached CRF Diskette Problem Report. A Substitute computer readable form must be submitted as required by 37 C.F.R. 1.825(d).
- ☐ 6. The paper copy of the "Sequence Listing" is not the same as the computer readable form of the "Sequence Listing" as required by 37 C.F.R. 1.821(e).
- ☐ 7. Other:

**Applicant Must Provide:**

- ☒ An initial or substitute computer readable form (CRF) copy of the "Sequence Listing".
- ☒ An initial or substitute paper copy of the "Sequence Listing", **as well as an amendment specifically directing its entry into the application.**
- ☒ A statement that the content of the paper and computer readable copies are the same and, where applicable, include no new matter, as required by 37 C.F.R. 1.821(e) or 1.821(f) or 1.821(g) or 1.825(b) or 1.825(d).

For questions regarding compliance to these requirements, please contact:

For Rules Interpretation, call (571) 272-0731 or (571) 272-0951  
 For CRF Submission Help, call (571) 272-2510  
 PatentIn Software Program Support  
 Technical Assistance. 1-866-217-9197 or 703-305-3028 or 571-272-6845  
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## Sequence Count Sheet

Application/Control No.

10/777,691

Examiner

Angela Bertagna

Applicant(s)

Khue Vu Nguyen

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DATE OF COUNT

Mark only one space below

- ☐ **(CRFN)** (CRF is unreadable; use CRF Diskette Problem Report)
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- ☒ **(CRFR)** (CRF required but none submitted; use Notice to Comply)
- ☐ **(bona fide)** (second or subsequent letter to applicant reporting bona fide attempt to comply; use Notice to Comply and send copy of RSL)
- ☐ **(non bona fide)** (second or subsequent letter to applicant reporting non-bona fide attempt to comply; use Notice to Comply and send copy of RSL)